ORIGINAL

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.

Advanced Television Systems and	)	
Their Impact Upon the Existing	)	MM Docket No. _____
Television Broadcast Service	)	

PETITION FOR EXPEDITED RULEMAKING

SINCLAIR BROADCAST GROUP, INC.

FISHER WAYLAND COOPER
LEADER & ZARAGOZA L.L.P.
2001 Pennsylvania Avenue, N.W.
Suite 400
Washington, D.C. 20006
(202) 659-3494

Martin R. Leader
Stephen J. Berman
David S. Konczal
Brendan Holland

Its Attorneys

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Summary

Sinclair Broadcast Group, Inc. ("Sinclair") hereby urges the Commission to modify its digital television ("DTV") rules and give DTV broadcasters the flexibility to transmit their digital signals using COFDM digital modulation technology. Following Sinclair's 1999 field trials, it is now clear that such action is crucial to the future viability of DTV in the United States. If broadcasters can operate under a COFDM-based alternative ATSC DTV standard, they will be able to offer ease of reception and reliable over-the-air DTV service to the American public, will have far greater flexibility in the video marketplace, and will benefit from a greater capacity for technological improvement. If the Commission instead maintains exclusive reliance on inflexible 8-VSB digital modulation technology, broadcasters will be unable to replicate their current NTSC service, and will struggle to adapt to new marketplace conditions in the next century. At the same time, Sinclair recognizes that many in the broadcast industry have already made a significant commitment to 8-VSB operations, and Sinclair does **not** advocate the abandonment of 8-VSB; rather, if the Commission grants the rule changes requested by Sinclair, broadcasters will be able to operate under either a COFDM-based or 8-VSB-based ATSC DTV standard.

Given the recent development of this technology, broadcasters using COFDM would be able to overcome complex multipath conditions and provide ease of reception and reliable over-the-air DTV service, including HDTV, to viewers using simple antennas within their stations' core business areas (their Grade A contours). Moreover, COFDM currently permits 6 MHz data rates of up to 24 Mbps, almost twenty-five percent greater than the forever-frozen 8-VSB rate of 19.34 Mbps, and further development of COFDM over the next decade will allow easy and reliable reception of COFDM at 24 Mbps and higher. In addition, COFDM would give broadcasters the flexibility to vary their data rates, permitting a variety of HDTV, Standard Definition TV, and mobile and portable DTV programming streams across their daily and weekly schedules. For

these reasons, a Commission decision to allow COFDM operations would stimulate consumer acceptance of DTV, accelerating its development and speeding the recapture of NTSC spectrum. Such action would also be consistent with the Commission's flexible approach toward other elements of the ATSC DTV standard, including scanning formats, and would permit the marketplace to play an appropriate role in the development of DTV broadcast technology.

Ample signal strength does not guarantee that consumers will be able to receive that signal, and, as described in detail in Sinclair's attached comparative study of COFDM and 8-VSB, the 8-VSB standard currently does not permit ease of reception or reliable DTV service through simple antennas in broadcasters' core business areas. Given the unreliability of this reception, 8-VSB broadcasters will be unable to replicate their NTSC service, and, during the digital transition, consumers will likely be forced to receive DTV service through large rooftop antennas. Even consumers able to afford such an outdoor antennas will suffer limited viewing functionality in markets with non-collocated DTV stations. In addition, given 8-VSB's fixed data rate, this standard will not allow the provision of mobile and portable video services.

As a result of all these factors, if the Commission continues its exclusive reliance on the 8-VSB standard, DTV will likely be perceived negatively by the public, thereby jeopardizing the digital transition. Even if the DTV transition is eventually completed, this policy would endanger the viability of free over-the-air television service, since an overwhelming majority of television households in the U.S. would be forced to subscribe to cable or satellite service.

In recent months, 8-VSB proponents have put forward a number of technical, operational, and economic reasons not to authorize COFDM operations in the U.S. (Sinclair's Petition does not address the COFDM/8-VSB report released by FCC's Office of Engineering and Technology on October 1, 1999. Sinclair will respond separately to the OET report within one week of the

filing of this Petition.) First, despite the doubts of entrenched 8-VSB interests, COFDM signals can be used to provide HDTV over 6 MHz channels, as shown by the 18.67 Mbps data rate achieved in Sinclair's Baltimore testing. In addition, while some argue that 8-VSB provides greater coverage than COFDM at equivalent power levels, this theoretical coverage gap appears to disappear under real-world conditions, as described in Sinclair's study. Finally, claims that technological improvements will allow 8-VSB to overcome dynamic multipath conditions are mere speculation, and in the absence of specific and identifiable consumer products that achieve these results, such promises cannot serve as the basis for the Commission's continued exclusive reliance on 8-VSB. In any case, given the fact that COFDM can currently support a variety of data rates up to a maximum of 24 Mbps, the potential for improvement of that technology is far greater than for 8-VSB, and Sinclair fully expects that COFDM will remain superior to 8-VSB across the full range of reception environments.

While defenders of the status quo claim otherwise, broadcasters, manufacturers, and consumers would not incur significant costs if the Commission decided to permit use of COFDM in the U.S. Any additional power and equipment costs for COFDM broadcasters would be borne voluntarily, and would likely be inconsequential. Grant of the instant petition would not impose significant costs on DTV receiver manufacturers, since it appears that the necessary equipment and expertise are already available to incorporate COFDM technology into DTV receivers targeted for sale in the U.S. Finally, the prior sale of 8-VSB receivers to a tiny fraction of consumers should not prevent the Commission from permitting broadcasters to use the COFDM standard.

Accordingly, for the reasons described above, Sinclair respectfully urges the Commission to modify through rulemaking the existing rule for digital modulation to permit broadcasters to

transmit their digital signals using COFDM technology. In its order, the Commission should institute a general principle of flexibility with respect to DTV modulation technology, establishing that broadcasters will be able to operate under either a COFDM-based or 8-VSB-based ATSC DTV standard. The Commission should facilitate COFDM operations by U.S. broadcasters by appointing an industry task force that would be directed to do the following, within 120 days of its appointment:

(I) Conduct a study and issue recommendations to the Commission regarding the integration of COFDM digital modulation technology into the ATSC DTV standard; and

(ii) Conduct a rigorous scientific analysis to determine the interference ratios for COFDM transmissions into existing NTSC and 8-VSB DTV signals.

Once this task force has performed these duties, the Commission should review its recommendations and adopt an alternative COFDM-based ATSC DTV standard. The Commission should establish simple procedures whereby broadcasters could demonstrate, using the interference ratios provided by the COFDM Task Force, that they will not cause interference to any operating NTSC or 8-VSB DTV broadcasters. Once a broadcaster has made this interference showing, it would be permitted to initiate COFDM operations. Sinclair urges that the Commission act expeditiously throughout this proceeding.

While this petition urges the Commission to permit COFDM operations, Sinclair does not have an inherent interest in the adoption of any particular digital modulation standard. Sinclair does believe, however, that the Commission, having mandated an accelerated shift to digital operations, must now take the steps necessary to make this transition successful and beneficial to all Americans. Since the development of COFDM has now raised the benchmark for DTV reception, the Commission should authorize use of this technology, allow the marketplace to play its appropriate role, and enable broadcasters to deliver the long-awaited era of advanced television to the U.S. public.

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Sinclair Broadcast Group, Inc. ("Sinclair") hereby urges the Commission to modify its digital television ("DTV") rules and give DTV broadcasters the flexibility to transmit their digital signals using COFDM digital modulation technology.[1/] If broadcasters can operate under a COFDM-based alternative ATSC DTV standard, they will be able to offer ease of reception and reliable over-the-air DTV service to the American public, will have far greater flexibility in the video marketplace, and will benefit from a greater capacity for technological improvement. If the Commission instead maintains exclusive reliance on the existing 8-VSB digital modulation standard, it is now apparent, in light of tests conducted by Sinclair and others, that broadcasters will be unable to satisfy even the minimum goal of replication of their current NTSC service, long a Commission objective in the transition to DTV. Having mandated an accelerated shift to digital operations, the Commission must now take the steps necessary to make this transition successful and beneficial to all Americans. The development of COFDM has raised the benchmark for DTV

1/ The following broadcast companies, representing the licensees of more than 140 commercial television stations, have already committed to support the instant petition: Bahakel Communications, Broadcast Media, Communications Corp. of America, Gray Communications Systems, Inc., Nexstar Broadcasting Group, LLC, Northwest Broadcasting, LP, Pappas Telecasting Companies, Paradigm, Paxson Communications Corp., Pegasus Broadcast Television, Inc., Quorum Broadcasting, Second Generation, Ltd., Sullivan Broadcasting Company II, Inc., Sullivan Broadcasting Company III, Inc., USA Broadcasting, Inc., and White Knight Broadcasting, Inc. A complete list of these companies' licensed stations is attached to the petition at Exhibit B.

performance, and the Commission should now authorize use of this technology, allow the marketplace to play its appropriate role, and enable broadcasters to deliver the long-awaited era of advanced television to the U.S. public.

Requested Relief

For the reasons fully described in this Petition for Expedited Rulemaking, Sinclair respectfully urges the Commission to modify through rulemaking the existing rule for digital modulation, adopted in the DTV *Fourth Report and Order* in 1996, to permit broadcasters to transmit their digital signals using Coded Orthogonal Frequency Division Multiplexing ("COFDM") technology. In its order, the Commission should institute a general principle of flexibility with respect to DTV modulation technology, establishing that broadcasters will be able to operate under either a COFDM-based or 8-VSB-based ATSC DTV standard.

With its order, the Commission should facilitate COFDM operations by U.S. broadcasters by appointing an industry task force ("COFDM Task Force") that would be assigned the following two responsibilities:

(i) The COFDM Task Force would be responsible for conducting a study and issuing recommendations to the Commission regarding the integration of COFDM digital modulation technology into the ATSC DTV standard; and

(ii) The COFDM Task Force would be responsible for conducting a rigorous scientific analysis to determine the interference ratios for COFDM transmissions into existing NTSC and 8-VSB DTV signals.

Given the narrow, well-defined scope of these responsibilities and the preexisting technical literature on these issues, the Commission should require that the Task Force complete its analysis and issue its recommendations and findings within 120 days of its appointment. Once the Task Force has performed these duties, the Commission should review its recommendations and adopt an alternative, COFDM-based ATSC DTV standard, and establish simple procedures whereby

broadcasters could demonstrate, using the interference ratios provided by the COFDM Task Force, that they will not cause interference to any operating NTSC or 8-VSB DTV broadcasters. Once a broadcaster has made this interference showing, it would be permitted to initiate COFDM operations.

As described in this Petition, broadcasters have an urgent need for flexibility in the choice of a digital modulation standard, and for this reason Sinclair urges the Commission to be expeditious in its (i) placement of this Petition on public notice; (ii) initiation of a rulemaking following the conclusion of notice and comment on this Petition; (iii) issuance of an order at the conclusion of this rulemaking; (iv) appointment of the requested COFDM Task Force; and (v) action on the recommendations of the COFDM Task Force.

Background

Sinclair. Sinclair is a publicly traded company with thousands of shareholders and a multi-billion dollar market capitalization. It is among the nation's largest group television owners, owning or programming approximately sixty commercial television stations. Given the magnitude of its broadcast interests, Sinclair has a huge stake in the development of DTV.[2/] Sinclair believes that the U.S. public deserves the best DTV service possible, is committed to the rapid introduction of this technology, and hopes to provide viewers with a quality of service that

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2/ Sinclair has been an extremely active commenter before the Commission and Congress in matters relating to digital television. In particular, Sinclair was one of the first broadcasters to recognize that the low DTV power levels assigned to UHF stations would prevent these stations from providing adequate service to their core market areas, and was at the forefront of the effort that led the Commission to raise its DTV power ceiling for these UHF licensees. *See* Petition for Reconsideration, Sinclair Broadcast Group, Inc., MM Docket No. 87-268 (June 13, 1997); Memorandum Opinion and Order on Reconsideration of the Sixth Report and Order, Advanced Television Systems and Their Impact on the Existing Television Broadcast Services, 13 FCC Rcd 7418, paras. 58-85 (1998).

exceeds that offered in today's analog world. While Sinclair urges the Commission to grant the instant petition and permit broadcasters to operate using COFDM technology, Sinclair has already invested millions of dollars to upgrade its facilities, and it is prepared to operate consistent with the existing ATSC DTV standard and meet all applicable DTV implementation deadlines.[3/]

Sinclair recognizes that the Commission has worked hard to fashion a regulatory and technical framework for DTV that will benefit both the broadcast industry and American consumers. As discussed further below, however, Sinclair is concerned that without further decisive action from the Commission, the transition to digital service could be a frustrating and ultimately unsuccessful process.

The Commission's Adoption of the 8-VSB Standard and the Timetable for DTV Implementation. The Commission began its proceeding on advanced television in 1987,[4/] and soon thereafter established a federal advisory committee -- the Advisory Committee on Advanced Television Service ("ACATS") -- to analyze potential DTV[5/] systems and ultimately recommend a transmission standard to the Commission.[6/] In 1991, ACATS invited interested parties to submit

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3/ Sinclair estimates that, overall, it will incur costs of approximately $300 million during the DTV transition.

4/ Notice of Inquiry, Advanced Television Systems and Their Impact on the Existing Television Broadcast Services, 2 FCC Rcd 5125, para. 3 (1987).

5/ While for many years the Commission referred to "Advanced Television" and "ATV," in this petition Sinclair now uses the more common term "DTV."

6/ Formation of Advisory Committee on Advanced Television Service and Announcement of First Meeting, 52 Fed. Reg. 38523 (October 16, 1987). The FCC selected the membership of ACATS from a wide range of industries. *See* Final Report and Recommendation of the Advisory Committee on Advanced Television Service, November 28, 1995, at para. II. B ("*ACATS Final Report*").

descriptions of their proposed DTV systems for future testing.[7] By the end of 1992, all but one of five remaining proposed systems were based on a digital transmission standard. While the vestigial sideband ("VSB") modulation standard was a component of these proposed digital standards, COFDM technology was still in the developmental stage and was not included in any of these proposals.

In 1993, ACATS eliminated the remaining analog proposal from consideration and concluded that each of the four remaining digital proposals required further refinement.[8] In May 1993, the remaining contestants formed the "Digital HDTV Grand Alliance,"[9] and, over the next two and a half years, ACATS tested and developed the Grand Alliance DTV system, which incorporated the 8-VSB standard.[10] PBS, MSTV, and CableLabs conducted field tests of the Grand Alliance system during the summer of 1995.

In 1994, during the test period for the Grand Alliance system, a new consortium of entities proposed that the Commission adopt COFDM as the digital modulation technology.[11] In response, ACATS formed a "Certifications Expert Group" ("CEG") to determine whether the newly proposed COFDM technology was "demonstrably superior" to the Grand Alliance 8-VSB standard; only if this were the case would the CEG recommend that COFDM technology receive

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7/ Fourth Interim Report of the Advisory Committee on Advanced Television Services, at 18-19 (April 1, 1991).

8/ *ACATS Final Report* at para. II. D.

9/ *Id.* The members of the Grand Alliance were AT&T, the David Sarnoff Research Center, General Instrument, the Massachusetts Institute of Technology, North American Phillips, Thomson Consumer Electronics, and Zenith Electronics.

10/ *See* Fourth Report and Order, Advanced Television Systems and Their Impact on the Existing Television Broadcast Services, 11 FCC Rcd 17771 (1996) ("*Fourth Report and Order*").

11/ *ACATS Final Report* at para. II. G.

further consideration.[12/] As indicated in ACATS' final report, the CEG found that COFDM was "not ready for [testing] at this time" and that the COFDM advocates "did not demonstrate the superiority of COFDM over VSB for the majority of markets."[13/]

The Advanced Television Systems Committee ("ATSC") was originally formed in 1983 to oversee certain aspects of DTV development.[14/] In 1995, ATSC identified those technical elements of the Grand Alliance system that it believed should be subject to a Commission-enforced standard, as well as those technical parameters which it believed should instead be defined by the marketplace.[15/] The "ATSC DTV Standard" emerged from this process. In November 1995, ACATS recommended that the Commission adopt the ATSC DTV standard,[16/] the Commission requested comment on this ATSC DTV standard in May 1996,[17/] and on November 27, 1996, the Commission adopted a modified form of this standard.[18/] In selecting this standard, one of the Commission's primary goals was to minimize potential interference

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12/ *Id.*

13/ *Id.*

14/ *See* Fifth Further Notice of Proposed Rulemaking, Advanced Television Systems and Their Impact on the Existing Television Broadcast Services, 11 FCC Rcd 6235 (1996) ("*Fifth FNPRM*").

15/ *Id.*

16/ *See ACATS Final Report.*

17/ *See Fifth FNPRM.* The Commission noted that, in adopting a DTV standard, it wished to achieve the following objectives: (1) ensure that all affected parties have sufficient confidence and certainty in order to promote the smooth introduction of a free and universally available digital broadcast television service, (2) increase the availability of new products and services to consumers through the introduction of digital broadcasting; (3) ensure that the rules encourage technological innovation and competition; and (4) minimize regulation.

18/ *See Fourth Report and Order.* The FCC codified its adoption of the ATSC DTV standard at 47 C.F.R. § 73.682(d).

between broadcasters' NTSC and DTV signals. In its final form, the ATSC DTV standard included 8-VSB as the standard for digital modulation, but specifically excluded any requirements for scanning formats, aspect ratios, and lines of resolution.

During the course of this ACATS/ATSC process, the Commission resolved numerous other technical and operational DTV issues. The Commission decided that a DTV system has to operate within a 6 MHz channel, and that broadcasters would be permitted to transmit DTV and NTSC signals simultaneously.[19/] The Commission determined that each existing full-power broadcaster would receive a DTV channel paired with its NTSC channel,[20/] and adopted simulcasting rules requiring each broadcaster to duplicate on its DTV channel a certain amount of NTSC programming.[21/] The Commission also developed a DTV Table of Allotments, with replication of NTSC service areas a primary goal in this process.[22/]

With respect to the schedule for DTV implementation, the Commission in 1997 set a general deadline of December 31, 2006 for the return of broadcasters' analog spectrum, and at the same time mandated an aggressive timetable for the construction of broadcasters' DTV facilities.[23/] Under this schedule, stations affiliated with the top four networks in the ten largest markets were required to construct their DTV facilities by May 1, 1999, while stations affiliated

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19/ First Report and Order, Advanced Television Systems and Their Impact on the Existing Television Broadcast Services, 5 FCC Rcd 5627 (1990) ("*First Report and Order*").

20/ *See* Sixth Report and Order, Advanced Television Systems and Their Impact on the Existing Television Broadcast Services, 12 FCC Rcd 14588, para. 11 (1997) ("*Sixth Report and Order*").

21/ *See* Fifth Report and Order, Advanced Television Systems and Their Impact on the Existing Television Broadcast Services, 12 FCC Rcd 12809, para. 54 (1997) ("*Fifth Report and Order*").

22/ *Sixth Report and Order* at para. 29.

23/ *Fifth Report and Order* at para. 76.

with these networks in markets 11-30 are required to complete construction by November 1, 1999. All other commercial stations are required to complete construction by May 1, 2002, while the construction deadline for noncommercial stations is May 1, 2003. In establishing this timetable, the Commission's goals were to encourage a rapid and successful transition from analog to digital service, to maximize the competitiveness of its DTV system internationally and domestically, to overcome any market disincentives to prompt DTV implementation, and to achieve an early return of the NTSC spectrum.[24/]

The Recent Development of COFDM. Since the Commission's selection of the 8-VSB standard in 1996, there has been significant development of COFDM modulation technology.[25/] The Digital Video Broadcasting Project ("DVB"), a global organization consisting of broadcasters, manufacturers, network operators, and regulatory bodies, began work on this technology in 1995. In 1997, DVB finalized its "DVB-T" digital television transmission format, and this standard was approved by the European Telecommunications Standards Institute ("ETSI") in February 1997. The manufacture of commercial COFDM decoder chips began in 1997, and COFDM chips were available for installation into commercial DTV receivers in 1998. The DVB-developed DTV transmission system is highly sophisticated, supporting 120 different

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24/ *Id.* at paras. 80-83.

25/ COFDM technology was truly developed internationally. The development of COFDM began at Bell Labs in New Jersey in the 1960's, with subsequent work on this technology performed by Canadian researchers in the 1980's, as well as by researchers at the Massachusetts Institute of Technology. In the early 1990's, there were European demonstrator systems developed. As indicated above, the DVB organization, headquartered in Switzerland, started development of COFDM in 1995, and produced the first COFDM standard in 1997. Commercial implementation of COFDM followed in 1998. In parallel, Japan developed the ISDB-T system over the past couple of years, also using COFDM. All of the leading COFDM silicon vendors, including LSILogic, Oak Technologies, and Motorola, are North American-owned companies.

operational modes, HDTV service, multichannel SDTV services, mobile television applications, and reliable reception with simple antennas.

The benefits of COFDM have led numerous countries all over the world to adopt this technology for their digital television systems. As of the date of this petition, Sinclair is aware that COFDM has been selected as the DTV modulation standard in the all of the European Union nations, including Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom ("U.K."). COFDM has also been chosen for digital modulation in Australia, India, Japan,[26/] and Singapore. In particular, the U.K.'s DTV service, called "OnDigital," began service in November 1998, and approximately 450,000 TV households there are now enjoying reliable, robust DTV reception through simple antennas. (Television receivers similar to those available in the U.K. were used in Sinclair's comparative study of the COFDM and 8-VSB technologies, discussed *infra* at 12.) Swedish broadcasters also began providing DTV service this year, and DTV service will begin shortly in Germany, Spain, and New Zealand. Before selecting their respective DTV modulation standards, Australia and Singapore each conducted an exhaustive, head-to-head laboratory and field trial comparison between 8-VSB and COFDM, in 1998 and 1999 respectively.[27/] COFDM was chosen in both instances, because these administrations concluded that it permitted a more modern DTV transmission that would provide ease of reception for all classes of consumers across a variety of TV reception environments.

[26/] In Japan, broadcasters will utilize an alternative COFDM DTV system developed by ISDB; the ISDB standardization process has recently been completed, and ISDB-developed decoder chips will become commercially available in the near future.

[27/] The Australia tests involved COFDM transmissions over 7 MHz channels, while Singapore's tests involved COFDM transmissions over 8 MHz channels.

In addition, COFDM is currently being considered in several Latin American countries, including Argentina, Brazil, Ecuador, Paraguay, and Uruguay. In particular, the Brazilian administration is now conducting the first government tests comparing the reception of COFDM and 8-VSB signals over 6 MHz channels. In the near term, COFDM will be adopted by countries with an aggregate market potential exceeding 300 million television households, three times the current size of the U.S. television market.

The Commission's Mass Media Bureau acknowledged the benefits of COFDM earlier this year in an order permitting licensees in the Multipoint Distribution Service ("MDS") and the Instructional Television Fixed Service ("ITFS") to operate using the related OFDM modulation technology. In granting licensees the right to do so, the Commission noted that OFDM offers performance features not available in other digital modulations, including the means for achieving very high data rates in severe multipath conditions."[28/] The advantages provided by COFDM were also described by the Consumer Electronics Manufacturing Association in its July 1999 comments on the potential uses of NTSC channels 60-62 and 65-67 following their return to the Commission. In its comments, CEMA proposed that the Commission use this spectrum for a new terrestrial Mobile Multimedia Broadcast Service ("MMBS").[29/] CEMA asserted that consumers in the U.S. are increasingly demanding mobility in their equipment for voice telephony,

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28/ *See* Declaratory Ruling and Order, Request for Declaratory Ruling on the Use of Orthogonal Frequency Division Multiplexing Modulation by Multipoint Distribution Service and Instructional Television Fixed Service Stations, 14 FCC Rcd 4121 (Mass Media Bureau, 1999).

29/ *See* Comments, Consumer Electronics Manufacturers Association, WT Docket No. 99-168 (July 19, 1999); Reply Comments, Consumer Electronics Manufacturers Association, WT Docket No. 99-168 (August 13, 1999). *See also* Notice of Proposed Rulemaking, Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, WT Docket No. 99-168 (June 3, 1999).

entertainment, information, and data services, and that COFDM should be the modulation technology for this new service in light of its ability to overcome mobile multipath problems.

Sinclair's Discovery of the 8-VSB Reception Problem. The events that culminated with the instant petition began in July 1998, when Sinclair initiated a series of demonstrations of DTV multichannel broadcasting. During these tests, which required that Sinclair's 8-VSB multichannel signal be received over-the-air and displayed on a number of television sets, Sinclair had difficulty receiving a picture even though its transmitter was just three miles away and its signal was quite strong at the test location. In order to conduct this demonstration, Sinclair was forced to use a sophisticated rooftop-mounted, outdoor directional antenna.

Following this demonstration, Sinclair investigated further the ease of reception under the existing 8-VSB modulation standard. Additional informal testing in the Baltimore area indicated that reliable, high-quality reception of an 8-VSB signal through simple antennas was highly problematic due to multipath effects. While Sinclair was concerned about these reception problems, it believed that the most likely cause of this difficulty was the particular susceptibility to multipath of early, non-commercial prototype DTV receivers.

Given the importance of high-quality reception, however, Sinclair set out to explore this issue further. Sinclair representatives met with top management officials at several receiver manufacturers, including Zenith, who indicated that the solution for any 8-VSB reception problem was a more sophisticated antenna design, not an improvement in modulation or receiver technology. Concerned that receiver manufacturers were uninterested in achieving reliable reception of DTV through simple antennas, Sinclair decided in March 1999 to conduct a more comprehensive examination of the ease of reception of 8-VSB signals, this time using commercially available DTV receivers. Sinclair selected the Philadelphia area as the location for

these tests, because four stations in the area were already transmitting a DTV signal and all of these signals were originating from the same transmission site. Sinclair's tests were designed to measure and compare the receivability of these stations' UHF DTV 8-VSB signals to UHF NTSC signals also being transmitted from the same site. These Philadelphia tests revealed that the 8-VSB signal was generally not receivable with simple antennas in indoor environments where NTSC signals enjoyed strong, acceptable reception.

The 8-VSB reception problems evident in the Philadelphia field trials prompted Sinclair to explore alternative transmission systems. In particular, Sinclair was aware of the ongoing implementation of DVB's COFDM standard in Europe and other parts of the world. Broadcasters were told, however, that while COFDM overcomes the effects of multipath, it could not support sufficiently high data rates to permit the provision of HDTV service over a 6 MHz channel. Prior to the 1999 National Association of Broadcasters ("NAB") convention in Las Vegas, Sinclair was approached by representatives of DVB to assist in a demonstration of its COFDM technology. To permit the display of mobile reception of a COFDM signal in a 6 MHz channel environment, Sinclair obtained Special Temporary Authority from the Commission to transmit a COFDM signal in Las Vegas, where it owns a station. In return, DVB configured its COFDM transmitter to transmit at an HDTV data rate of approximately 18.7 Mbps, thereby permitting Sinclair to test reception of COFDM at HDTV rates. Subsequently, Sinclair designed and conducted a study of the comparative ability of 6 MHz COFDM and 8-VSB systems to deliver HDTV service to simple consumer grade antennas both indoors and outdoors under real-world conditions. Sinclair ultimately expanded this testing to include an evaluation of reception at the fringes of a typical broadcaster's coverage area.

As discussed below and in Sinclair's published report,[30/] attached at Exhibit A, Sinclair's study demonstrates that an 8-VSB signal cannot be received reliably today with a simple antenna in a station's core business area under real-world conditions. In contrast, use of COFDM technology eliminates multipath effects and allows ease of reception with simple antennas even in highly dynamic multipath environments.[31/]

Discussion

Sinclair does not have an inherent interest in the adoption of any particular digital modulation standard. Since the Commission adopted the 8-VSB standard in November 1996, however, the development of COFDM modulation technology has raised the benchmark for digital over-the-air reception, and the Commission's DTV policies must now respond to this new reality. COFDM -- now being adopted all over the world -- would allow broadcasters in the U.S. to overcome complex multipath conditions and provide ease of reception and reliable over-the-air DTV service to viewers using simple antennas. COFDM broadcasters could also offer a wide variety of mobile and portable video services, and, given that COFDM currently permits data rates

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30/ "Comparative Reception Testing of 8-VSB and COFDM in Baltimore," Nat Ostroff, Vice President New Technology, Sinclair Broadcast Group, and Mark Aitken, Advanced Technology Group, Sinclair Broadcast Group (September 24, 1999) ("*Comparative Study*").

31/ On September 30, 1999, the Commission's Office of Engineering and Technology ("OET") released a report that addresses whether the 8-VSB standard should be replaced with COFDM. *See* "DTV Report on COFDM and 8-VSB Performance," Office of Engineering and Technology, Federal Communications Commission, FCC/OET 99-2 (September 30, 1999) ("*OET Report*"). Given (i) the recent release date of the *OET Report*, (ii) the breadth of this report's assumptions and conclusions, and (iii) the fact that Sinclair here asks only for authority to use COFDM technology as an alternative to 8-VSB rather than for an abandonment of that standard, Sinclair does not address the OET Report in this Petition. At the same time, since the *OET Report* does reflect OET's current understanding of the relative advantages and disadvantages of COFDM and 8-VSB performance, Sinclair intends to issue a separate response to this report within one week of the filing of this Petition.

almost twenty-five percent higher than the fixed 8-VSB data rate, such broadcasters would also benefit from a greater capacity for technological improvement. In contrast, given the fixed nature of the 8-VSB data rate of 19.34 Mbps and the inability of the 8-VSB standard to deliver a reliable signal to viewers using simple antennas within broadcasters' core business areas, continued exclusive reliance on the 8-VSB standard would likely stunt the growth of DTV in the U.S. In light of this changed environment, the Commission's course is clear: It should allow the marketplace to play an appropriate role, and give broadcasters the flexibility to operate under a COFDM-based alternative ATSC DTV standard. Such action would provide crucial benefits to American consumers, and would heighten the broadcast industry's competitiveness in the growing global telecommunications marketplace.

I. The Commission Should Allow Broadcasters to Operate Using COFDM Technology

A. Use of COFDM digital modulation technology will permit ease of reception and reliable over-the-air DTV service to viewers using simple antennas in broadcasters' core business areas

As the first television century draws to a close, viewers in the United States have grown accustomed to a sufficient "ease of reception" of television programming. These viewers now expect their television sets to work "out of the box," without the need for complicated or time-consuming peripheral installations. Broadcast consumers rely heavily on simple, inexpensive antennas that can be deployed indoors on a relatively inconspicuous basis,[32/] and these viewers are accustomed to the practically instantaneous channel "surfing" made possible by omnidirectional reception (without antenna manipulation) and remote control devices. Accordingly, true

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32/ For example, in 1997, approximately seven million indoor antennas were sold in the U.S., while in 1996 6.3 million indoor antennas were purchased. The average price of these antennas of those antennas was approximately $8. *See* This Week in Consumer Electronics, Vol. 13, No. 8 (March 16, 1998).

replication in the DTV environment now requires more than mere replication of signal strength throughout a broadcaster's service area; rather, it is critical that DTV viewers also enjoy the greatest possible ease of reception and reliability of over-the-air service throughout these service areas.

In order to maximize ease of reception and reliability of service, DTV broadcasters must overcome the complex multipath conditions that are common to today's urban and suburban environments. Multipath effects result from the abundance of structures and objects, both natural and man-made, that can reflect a DTV signal. "Static" multipath effects result from the reflection of a DTV signal off of a stationary structure or object; these can include walls and furniture within a house, the exterior of adjacent houses and buildings, lighting and electricity poles, and mountains and other nearby terrain. "Dynamic" multipath effects, which are particularly unpredictable and difficult to correct, are caused by reflections of a DTV signal off of moving objects, such as moving people or animals, automobiles, aircraft, rain or other precipitation, falling leaves, and any wind-blown object. While in the analog television environment, signal interference and multipath effects result only in picture "snow" and "ghosting," multipath conditions in the DTV environment can cause complete loss of reception.

8-VSB technology was developed with the goal of replicating NTSC signal strength at HDTV data rates, despite the fact that ample signal strength does not guarantee that consumers will be able to receive that signal. In contrast, COFDM was designed to replicate or improve the quality of reception by overcoming the known effects of multipath conditions. In fact, while 8-VSB reception is distorted by multipath effects, COFDM reception is enhanced by multipath conditions. The ability of COFDM signals to overcome such conditions results from the fact that

the COFDM data payload is divided between a large number of carriers.[33/]

Sinclair's *Comparative Study* demonstrates conclusively that use of COFDM permits ease of reception and reliable over-the-air DTV service, including HDTV service, by viewers using simple, consumer-grade antennas both indoors and outdoors in broadcasters' core business areas (their Grade A contours). In its Baltimore field trials, Sinclair tested reception of COFDM and 8-VSB signals using simple, consumer-grade antennas in real-world, complex multipath conditions. Sinclair transmitted the COFDM and 8-VSB signals over a standard 6 MHz U.S. channel allocation at equal average power levels, with both the COFDM and 8-VSB systems sustaining data rates that permit the provision of HDTV service.[34/] Sinclair used receivers that were generally available to the broadcast industry and the consumer at that time, and it used common antenna, transmission, and receive systems throughout this testing period.[35/]

Comprehensive testing was conducted at forty sites -- both indoor and outdoor -- in and around the Baltimore area, with all but nine of these locations inside the transmitters' Grade A contour. Sinclair's COFDM transmissions were successfully received at all thirty-one sites inside the Grade A contour, through both a dipole and a double bow-tie antenna, with a substantial "margin to failure" at most sites. In addition, in order to further measure the comparative ease of

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33/ The COFDM signals used in the *Comparative Study* were divided into 1705 separate carriers. While each COFDM carrier's data rate is very slow, the totality of all the carriers closely matches the 8-VSB payload. Each carrier's data rate is slow enough, however, that the COFDM system can receive signals from all directions without a penalty -- in fact, the extra signals received from nonaligned reflections actually improve reception. In addition, a directional antenna is not needed to receive COFDM service in broadcasters' core business areas.

34/ While the 8-VSB system automatically delivered programming at its fixed data rate of 19.34 Mbps, Sinclair chose a COFDM data rate of 18.67 Mbps from a number of different throughput options. This rate was selected since it permits the provision of HDTV service while ensuring high-quality reception through simple antennas.

35/ These systems are described in detail in the attached *Comparative Study*.

reception for the COFDM and 8-VSB systems, Sinclair investigated the effects on reception from changes in the orientation of the receiver antenna. In more than fifty percent of the COFDM reception opportunities, reception of the COFDM signal was maintained while shifting the antenna orientation over a 180 degree arc. In contrast, as discussed further below, 8-VSB transmissions were successfully received at approximately one-third of these sites, and even at those sites, reception was typically lost as a result of an antenna movement over a considerably narrower arc. *Comparative Study* at 9.

Thus, it is clear from Sinclair's Baltimore tests that use of COFDM overcomes the effects of complex multipath conditions and permits ease of reception and reliable over-the-air DTV service through simple antennas. In fact, with COFDM, ease of reception in these core areas will likely be even greater than in the existing NTSC service environment.

B. Use of COFDM would enable broadcasters to provide a variety of fixed, mobile, and portable DTV video services

COFDM modulation technology not only would permit reliable reception of DTV through simple consumer-grade antennas, it would also enhance broadcasters' flexibility in formatting their DTV programming streams and providing mobile and portable DTV video services. In contrast to the 8-VSB standard, which limits a broadcaster to one fixed data rate, COFDM technology permits broadcasters to vary their data rates (4 to 24 Mbps) to achieve a wide range of operational modes and meet a variety of service goals.[36/] Using COFDM, broadcasters could transmit (i) an 18.7 Mbps programming stream for HDTV service, (ii) multiple Standard Definition TV ("SDTV") programming streams at various data rates, or (iii) data streams that

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36/ The ability of COFDM broadcasters to operate at reduced data rates would be crucial in public safety emergencies, when reliability of reception is paramount. At lower data rates, a digital broadcast signal is less likely to be disrupted by multipath conditions or other real-world impairments, due to a lower carrier-to-noise ratio.

would permit mobile or portable DTV video services.[37] In particular, the use of COFDM for mobile and portable services would be crucial to promoting DTV development, given that consumers in the U.S. and elsewhere are increasingly demanding mobility in their equipment for a variety of communications services. While CEMA recently asked the Commission to reallocate returned broadcast spectrum specifically to mobile data services (with COFDM as the digital modulation technology), such action would be unnecessary if the Commission allowed DTV broadcasters to commence COFDM operations and provide these advanced services over already-allocated broadcast frequencies.[38]

With the ability to transmit data streams at varying rates, COFDM DTV broadcasters could provide a mix of digital services not possible with 8-VSB, with the overall menu of offerings shifting over a broadcaster's programming schedule. For instance, during the evening rush hour a DTV broadcaster might transmit one HDTV channel, and one mobile DTV channel receivable by automobile passengers, mass transit vehicles, personal DTV walkmen, and DTV-enabled laptop computers.

37/ Sinclair defines "portable" services as those received by persons traveling at or below walking speed, while "mobile" services are those received by persons traveling faster than walking speed, including persons being transported in automobiles, trains, and other vehicles.

38/ By permitting portable and mobile reception, use of COFDM would likely enable DTV broadcasters to accelerate their provision of ancillary subscription video services, which the Commission subjects to a five percent revenue fee. *See* 47 C.F.R. 73.624(g); Fees for Ancillary or Supplementary Use of Digital Television Spectrum Pursuant to Section 336(e)(1) of the Telecommunications Act of 1996, 14 FCC Rcd 3259 (1998). Exclusive reliance on 8-VSB, which does not permit mobile service applications, will greatly slow the emergence of such services.